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ABSTRACT

This study attempts to determine the potential economic impact of increasing levels of intergovernmental educational grants on school district spending decisions. This question is addressed through a cross-sectional analysis of the choice decisions made by 192 school districts in Kentucky. A conceptual model that evaluates the trade-off between educational service expenditure and local tax burden is developed and empirically tested. Results of the analysis suggest that in the long run, school districts in Kentucky tend to substitute state and federal efforts for local efforts. The estimated differences in the state and federal aid coefficients indicate that state aid is more efficient in achieving the desired objective of improving the distribution of educational support programs. The results also suggest a price inelastic demand for educational service. (Author/JG)

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ABSTRACT

This is an economic study of the local school district decision to provide educational opportunity. Specifically, it asks the question: What are the potential economic consequences of increasing the level of intergovernmental grants on the local school district decision to allocate scarce financial resources to public primary and secondary education? An answer to this question is suggested by a cross-sectional analysis of the choice decisions made by 192 school districts in the state of Kentucky.

A conceptual model which evaluates the trade-off between educational service expenditure and local tax burden is developed and empirically tested. It is concluded that in Kentucky local school districts tend to substitute outside effort for local effort. The study also suggests that state aid is more efficient than federal aid in achieving its goal. A price inelastic demand for educational service is also suggested by the results.

THE INFLUENCE OF STATE AND FEDERAL AID ON THE DEMAND FOR EDUCATIONAL OPPORTUNITY IN KENTUCKY

Vincent Cusumano and Kurt R. Anschel*

INTRODUCTION

Societal and judicial concern over the distribution of educational opportunity and its apparent need to understand the interrelationship between state and federal support programs and local school district decisions motivated this research effort.

In a series of court cases, Serrano v. Priest in California, Rodriquez v. San Antonio Independent School District in Texas, Durartz v. Hatfield in Minnesota, for example, the courts have held that the system of financing public primary and secondary education through local property taxation discriminates between the rich and poor. Accepting the premise that educational quality is measured by per pupil expenditures, it is concluded that unequal educational expenditures reflect unequal educational opportunity.

Although this argument was not upheld by the U.S. Supreme Court in a 5 to 4 decision, its ruling must be interpreted as a warning. In fact, the minority opinion expressed by Judge Marshall supports the concept that education is a fundamental interest and, therefore, requires

equal protection under the U.S. Constitution. Judge Marshall said:

> "The majority's holding can only be seen as a retreat from our historic commitment to equality of educational opportunity and as unsupportable acquiescence in a system which deprives children in their earliest years of the chance to reach their full potential as citizens" (quoted in Fleming, 1974).

In Kentucky as well as other states, considerable political pressure has been created to provide a more equitable distribution of educational opportunity. However, under the assumption that local districts are maximizing their preference function with respect to locally provided education subject to the relevant socio-economic and political constraints, the observed expenditures reflect optimum willingness to support education. Thus, if local districts are to spend more, the additional revenues will have to come from outside sources. Political and legal autonomy, however, permits fiscal and allocative decisions to be made independently and in accord with local voter preferences. It is conceivable, therefore, that an outside aid program would have the effect of increasing the disparity in educational opportunity, instead of the desired effect of decreasing it. The purpose of this paper then is to examine the interrelationship between local educational service decisions and outside grants-in-aid.

THE MODEL[1]

The local school district is viewed as an economic unit whose goal is to maximize a specific criterion function subject to the relevant constraints. Conceptionally, the decision-making process is viewed from two dimensions: (1) a consumption decision which evaluates the trade-off between local educational services and tax burdens; and (2)

a production dimension which is concerned with the demand for educational factors of production.

In what follows, the a priori effects of grants-in-aid on educational service demand are specified. According to the traditional theory of consumer behavior, the demand for goods and services depends on their price, income, stock of wealth, prices of related goods and services, and consumer tastes (Friedman, 1962). Analogously, the demand for local educational services (e_s) is a function of local tax burdens (b_s) which are an increasing function of tax collections (t_s), and a decreasing function of income (Y_s), the price of educational inputs (P_s^e), the price index of the "standard good" (P_s^o), the level of state and federal aid (S_s and f_s), and finally a series of political interest and community taste variables (Z_s). The income variable enters the demand function through its influence on tax burdens. Stated in more concise notation:

$$e_s = e_s [b_s (t_s, Y_s), P_s^e, P_s^o, (S_s + f_s); Z_s].$$

Three a priori theoretical effects of state and federal aid are identified. These are:

1. A substitutive effect when local school districts substitute outside effort for local efforts;
2. A stimulative effect if local school districts actually increase their local tax effort as a result of increments in state and federal aid; and
3. A neutral effect if the change in educational services is exactly equal to the change in state and federal grants.

These possible effects are directly derived from the budget constraint. Consider the budget constraint:

$$P_s^o (e_s) = P_s^o (t_s) + P_s^e (S_s + f_s).$$

Total differentation of this equation and solving for the change in e_s with respect to changes in state and federal aid $(S_s + f_s)$ yields the following:

$$de/d(S_s + f_s) = 1 - dP_s^e/d(S_s + f_s) + [P_s^o/P_s^e][dt_s/d(S_s+f_s)] +$$
$$[t_s/P_s^e][dP_s^o/d(S_s + f_s)] + [(S_s + f_s)/P_s^e]. \ [dP_s^e/d(S_s + f_s)]$$

Assuming that aid is distributed in a lump-sum form, then the relative price ratios are not affected, [Wilde, 1968], i. e.,

$$dP_s^e/d(S_s + f_s) = 0 \text{ and } dP_s^o/d(S + f) = 0$$

This simplifies the above expression into:

$$de_s/d(S_s + f_s) = 1 - [P_s^o/P_s^e \cdot dt_s/d(S_s + f_s)].$$

A substitutive effect is one where:

$$0 < [de_s/d(S_s + f_s)] < 1. \text{ Likewise,}$$

$$\text{if } P_s^o/P_s^e \ [dt_s/d(S_s + f_s)] > 0 \text{ then}$$

the grant-in-aid is stimulative. And the effect is neutral, if

$$P_s^o/P_s^e \ [dt_s/d(S_s + f_s)] = 0$$

Empirical Specification of the Educational Service Response Function (e_s).

The total educational services (e_s) package available for local household consumption is measured by total current expenditures per pupil in average daily attendance (ADA). Response functions utilizing total instructional expenditures per ADA, total per pupil expenditures

not directly related to classroom work (administrative, health services, and attendance expenditures) and total per pupil expenditures for transportation, operation of plant, fixed charges were also estimated in order to observe the allocative behavior of local school districts.

The price index of educational inputs (P_s^e) is measured by taking the product of two elements: (1) the ratio of full-time equivalent professional staff to students in ADA, and (2) the average per annum salary of all educational professional staff members.

An index similar to this was also used by Hambor, Philips, and Votey (1972). The Hambor, Philips and Votey index, however, defined the ratio only in terms of teachers per pupil. In the above P_s^e, non-classroom factors of the educational production process are also incorporated.

The price index of the "Standard Good" (P_s^o) theoretically measures the opportunity cost of consuming education. For the purpose of this study, this variable is operationally defined as the proportion of total personal income per capita available for non-educational goods and services.

The state aid (S_s) variable is defined as the total amount of educational revenue per pupil received by the s-school district under the auspices of the state's Minimum Foundation Program.

Likewise, federal aid (f_s) is measured by the amount of per pupil support going directly to the s-school district under the various stipulations of the National Education Act of 1965.

The community taste variables (Z_s) are assumed to be related to

the socio-economic characteristics of the school district. Using principal component factor analysis, the numerous Z variables were reduced to three. The political organizations of the school district (Z_1) was measured by a "dummy" variable. The independent school districts were coded as one and the county districts were coded as zero. An index of financial ability to support education (Z_2) was also introduced into the analysis. A final variable (Z_3) was measured by the percent of total pupil enrollment in high schools.

The tax burden variable (b_s) was taken into consideration by looking at the total tax collections from local sources per pupil in ADA (t_s), and per pupil personal income (Y_s).

RESULTS AND DISCUSSION

In Table I, the results of the empirical testing of the above model are presented. The state and federal aid variables are highly significant in all of the hypothesized models. In fact, the three elements of the budget constraint (t_s, S_s, f_s) are highly significant at the .01 probability level. In the CE_η (Total Current Expenditures per Pupil (CE)) model both the state and federal aid coefficients are less than one, suggesting a substitutive effect. For example, for every dollar increase in state aid, CE increases in about 50 cents. Only 8 cents of additional CE is registered for the federal aid variable. Stated differently, this result implies a decrease of about 50 cents in local effort for every dollar of state aid and a 92 cents decrease due to federal aid.

Converting the response coefficients into elasticity[2] estimates yields the following:

Table I - Regression Results Using Per Pupil Current Expenditures and its Components as Dependent Variables

Dependent Variable	Independent Variables: Constant	Z_1	Z_2	Z_3	Ys	P^e_s	P^o_s	Ts	Ss	Fs
	b-coefficients									
CE	428.6	-10.8	+.0037	+.74	+.0026	+.256	-363.7	+.537	+.499	+.083
R^2=.848, F=111.09	(2.65)	(-2.64)	(+1.02)	(1.44)	(4.49)	(5.22)	(-2.22)	(10.4)	(7.46)	(3.65)
IE	372.2	+6.49	+.0097	+2.04	+.0032	+.270	-363.4	+.298	+.312	.038
R^2=.832 F = 98.60	(2.54)	(1.73)	(3.01)	(4.39)	(6.07)	(6.07)	(-2.44)	(6.33)	(5.13)	(1.87)
AAHE	32.1	+13.32	-.0028	-1.034	-.00015	+.044	-22.25	.0442	.053	-.005
R^2= .504 F = 20.20	(.027)	(8.58)	(-2.03)	(-5.36)	(0.69)	(2.38)	(-0.36)	(2.26)	(2.10)	(-.64)
OCE	24.3	-30.67	-.003	-2.69	-.0004	-.058	+21.96	+.195	+.134	+.05
R^2=.569 F = 26.2	(.24)	(-12.02)	(-1.54)	(-.85)	(-1.23)	(-1.93)	(.216)	(6.09)	(3.24)	(3.54)

CE = Total Current Expenditures Per Pupil in ADA
IC = Total Instructional Expenditures Per Pupil in ADA
AAHE = Total Expenditures for Administration, Attendance and Health Services Per Pupil in ADA.
OCE = Other Current Expenditures Per Pupil in ADA
( ) = t-value

$Y_s = .04$, $P_s^e = .21$, $P_s^o = -.7361$, $t_s = .17$, $S_s = .37$, $f_s = .03$

For the state and federal aid variables, the elasticity estimates are both positive, but less than unity. A percent increase in state aid, for example, is accompanied by a .37 percent increase in CE. An aid elasticity measure of this magnitude implies a demand for educational services at the local level that is price inelastic. That is to say, a priori if the price elasticity of any goods or services is inelastic, then a decrease in the price of that good will result in the allocation of proportionately less income to the purchase of that good or service. Conversely, if the price elasticity measure is elastic, a decrease in price implies an increase in the percentage of total income allocated to the consumption of that good. Extending this concept to the local school district demand for educational services, it can be asserted that if outside funds cause the supply of educational services to shift outward and to the right, the per unit price of education to local residents decreases. Hence, if the demand schedule is price inelastic the percentage of total income devoted to education also decreases, resulting in an increase in the consumption of other goods or services. An aid elasticity measure of .37 suggests this phenomena to take place.

A price inelastic demand for education is also suggested by the elasticity measure for the P_s^o variable. This variable measures the opportunity cost of consuming educational units and, therefore, the price of education for local households. A percent decrease (increase) in the consumption of other goods is associated with a .736 increase (decrease) in the consumption of educational services.

This result of a price inelastic demand for educational services is in contrast to the Hambor, et al. (1973) findings. In the Hambor study, they estimated a price elasticity value of -1.10. The difference in findings, however, may be in the methodological approach used. Hambor, et al. used a simultaneous equation system to estimate price and income elasticity. The results of this study are based on single equation estimating techniques. However, the theoretical deduction that is made from the aid elasticity variable is consistent with the elasticity estimate on the opportunity cost variable P_s^o.

It is expected that the elasticity measure on the income variable (Y_o) would be positive. Also, from previous studies (McLoone, 1961; Brazer, 1959) it can be hypothesized that the magnitude of the income elasticity will be less than one. Although the regression analysis (income elasticity value of .04) indicates acceptance of hypothesis, the elasticity value is relatively low when compared with previous results. McLoone (1961) estimated the income elasticity for educational expenditures to be equal to .96 for the time periods 1920-30 and 1957-58. Brazer (1959) basing his results on a cross section of 40 large cities, estimates the income elasticity to equal .73. Differences in data bases and statistical techniques, as well as possible restrictions placed on Kentucky school districts may be the reasons for the observed differences.

In Table 2, important insights into the allocative behavior of school districts are obtained by analyzing the response functions for

the components of C.E., i.e., instructional expenditures (IE), expenditures for administration, health services and attendance (AAHE), and other current expenditures (OCE). Table 2 summarizes the state and federal aid response coefficients for these expenditure categories. For example, a dollar increase in state aid decreases local tax efforts by $.501, and increased total current expenditures by .499. About 27 percent of this increase in CE, however, is allocated to such expenditure categories as pupil transportation, and plant maintenance and operation (OCE). Thirty-one cents or 62 percent of the increase in CE is assigned to instructional expenditures and the remaining $.05 is allocated to increasing the level of health services, administration, and pupil attendance services (AAHE). Besides decreasing local taxes, state aid, then is primarily used for instructional purposes. The same, however, cannot be concluded for federal aid. Over 60 percent of the total increase in CE resultings from federal funds are used to increase non-instructionally related services.

CONCLUSIONS

The objective of this paper has been to construct an analytical model of school district decision-making and to test it emperically. Yet, its ultimate objective is the evaluation of alternative policy decisions, thereby improving our ability to understand and direct school districts towards the desired direction.

The results of the analysis suggest that in the long run school districts in Kentucky tend to substitute state and federal efforts for local efforts. The estimated differences in the state and federal aid coefficients indicate that state aid is more efficient in achieving

Table 2. Estimated State and Federal Aid Response Coefficients for Selected Expenditures Categories

e_s Variable	$\frac{\partial e_s}{\partial S_s}$	$\frac{\partial e_s}{\partial F_s}$
CE	.499***	.083***
IE	.312***	.038*
AAHE	.053**	-.005
OCE	.134***	.050***
Total	.499	.083

Note:

***Statistically significant at the .01 level of probability.
** Statistically significant at the .05 level of probability.
* Statistically significant at the .10 level of probability.

the desired objective of improving the distribution of educational support programs. Having determined the allocative consequences of state and federal aid, the normative questions of how to achieve a more equitable distribution of educational opportunity may be addressed.

The substitution effect of grants-in-aid reported in this analysis is consistent with previous studies (Bahl, 1968). Perhaps the implicit goal of these programs is to reduce local tax burdens. However, if the sole objective is to produce more educational services, then the findings of this study argue for a restructuring of these programs.

The information about price elasticity for allocation is also important from the point of view of educational policy and evaluating program benefits. Using changes in consumer surplus as a measure of marginal benefits, the relative impact of state and federal aid may be evaluated.

Footnotes

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1/The conceptual model for local school district decision-making relies heavily on the accepted economic theorems of modern demand theory (Wu and Pontney, 1967), production economics (Carlson, 1956) constrained optimization, the socio-political setting described by Tiebout (1956), Duncan Black (1948), Buchanan and Tullock (1961), Davis and Haines (1956), and the collective choice model developed by Williams (1963, 1966), Bradford and Oates (1971), (1972), Shibata (1975), and Wilde (1968).

2/Elasticity = $B_i \cdot \bar{X}_i/\bar{Y}$ where B_i is the estimated response coefficient of variable X_i and $\bar{X}_i$ is the mean value of X_i and $\bar{Y}$ is the average of the CE variable.

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